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ABSTRACT

Concepts of costs and cost analysis in higher education are examined, along with how to prepare for a cost study. Specific cost analysis techniques are identified, along with types of data generated and potential problems. In preparing for cost studies, it is important to consider: purpose, types of cost analysis, types of cost, common calculations of cost, and cost measurements. The first step is to determine the decisions/policy implications that will be addressed. Any study will consider how much something costs and why it costs that much. Possible kinds of costs that can be calculated are: cost objectives (e.g., input); cost basis (e.g., historical); cost variability (e.g., fixed); cost-activity relationship (e.g., total); cost-determination method (e.g., specific service); and cost-time relationship (e.g., time period). In higher education, the most common costing approaches are the calculation of: historical, full, average cost of outputs; and historical, total, indirect costs of inputs. Formula budgets based on costs studies are widely used by states and systems. Four ways of measuring costs of a program or activity are addressed, along with three stages of a cost-benefit analysis. An extended example of how to think through a proposed study of the costs of enhanced student recruitment is included. (SW)

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Concepts of Cost and Cost Analysis for Higher Education

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Costing can be a useful planning and management tool. It can provide information relevant to assessing operational efficiency, planning an investment strategy, evaluating comparative performance, or justifying funding requests and prices charged for services (Balderston, 1972). Given the utility of cost data, it is not surprising that virtually every institutional researcher deals with such data at least occasionally. Some may have responsibilities for [illegible] cost analyses. Others may have to [illegible] for such analyses. In other cases, [illegible] better understand [illegible]. Cost is one of those generic [illegible], but it has technical nuances that can [illegible] reasonably well acquainted with the field. These nuances, moreover, are complicated by the involvement of several disciplines and professions.

This issue of the *AIR Professional File* presents ideas about cost that could expand the horizon for institutional researchers and perhaps point to alternative directions in which they might take their analyses and interpretations of cost. It is broader in scope than previous issues in this series (Hample, 1980; Taylor, 1982; 1984), which provided a useful focus on several specific aspects of costing in higher education. In addition, a wide variety of literature is cited to facilitate the further pursuit of particular questions, problems, or interests.

While the primary focus of the discussion that follows is on concepts of cost, the discussion is set within the context of preparing for a cost study. In a strict sense, there is no one single right way to do any given cost study, much less cost studies in general. There is, however, a series of questions and issues that should be pursued in preparing to do such studies. These questions and issues, in turn, form a natural framework within which the various cost concepts can be addressed. The major segments of that framework are as follows: purpose, types of cost analysis, types of cost, common calculations of cost, and cost measurement. The concluding section of the article is devoted to an extended example of how one might think through a proposed study.

What is the Purpose of the Study?

When asked to do a study of any kind, it is always a good idea, of course, to nail down as precisely as possible the purpose of the study. This is certainly true for costing, as much else depends on purpose. Fortunately, there are some general statements that can be made about the purpose of such studies. These generalities suggest a line of questioning that can help to elucidate the specific purpose in a given situation.

The general purpose of any cost study is, or ought to be, to support decision making (Fisher, 1971). Identifying the decisions or policy implications that lie in the balance thus constitutes an important first step. Is a new program being considered? Or a new date for tuition payment? Or an early retirement plan? Cost information would be relevant in each instance, but very different sorts of studies would be entailed.

Any cost study will address one of two general questions: *How much* does something cost? *Why* does it cost that much? An attempt to explain costs often follows as an afterthought to a typical "amount" study, especially if the study's results are controversial. A study

that compares costs among departments, for example, is likely to generate a request for explanation Analysts would do well to discuss with those who request such studies the extent to which explanations or other types of background material are going to be needed Indeed, before a proposed cost study is undertaken, analysts should be willing to take the lead in examining likely reactions and follow-on questions

Relatedly, it ought to be made clear at the start which of several possible perspectives on cost is most appropriate for the purposes at hand The major disciplines involved in costing have tended to devise their own ways of dealing with cost and cost behavior One or the other will be preferable in a given situation, depending on the issues to be decided For instance, with respect to operations in the computer center, cost accountants would likely do detailed and very specific analyses of the allocation of resources in an effort to determine unit costs The approach is nontheoretical and is meant to document rather than to explain The business officer, by contrast, would be likely to focus on financial-management issues such as the balance of revenues and expenditures, the share of institutional resources going to the center, or the decision to lease or buy equipment The economist would focus on the relationship between inputs and outputs (the "production function") or on the relationship between cost and output (the "cost function") The approach, although applied, would be thoroughly grounded in economic theory Useful commentaries on the distinctions between cost accounting, financial accounting, and cost analysis can be found in Gamso (1978) and in Walzenbach (1982) Bowen's (1980) comprehensive analysis of costs in higher education is useful for interpreting costs in a broad economic and social context As a generalist, the institutional researcher has a particular need to determine the kind of data and overall approach that will be most useful

On occasion, the request for a cost study will be sharply defined and delineated by virtue of the inherent nature of the issues involved or because the individual requesting the study has done an adequate prior analysis Other requests, however, such as, "We seem to be spending a lot for this service; I need an appraisal by the next board meeting," are an open invitation to unmet expectations if further clarification of purpose and perspective is not obtained One seeks to avoid the comment, "This study is of no help because you looked at Y and we needed to know X"

What Type of Cost Analysis Should Be Done?

The choice of analytic approach should be considered next An overview of cost analyses as they have actually been done can provide a sense of what the possibilities are Particularly useful in this regard is a four-part schema developed by Carlson (1976) for categorizing such studies in terms of method Cavanaugh (1969), Powell and Lamson (1972), Witmer (1972), and Adams, Hankins, and Schroeder (1978) provide overviews based on chronology and matter as well as method According to Carlson, the largest group of studies simply provides various cost calculations. They may make use of basic statistical measures, such as means, standard deviations, and occasionally, t-scores, but they make no attempt to relate variables statistically. A typical example would be a comparison of cost per credit hour across a set of departments, programs, or colleges, in other words, it is the sort of cost data one is likely to find in most institutional fact books This type of data is basic and ought to be available, yet it leaves much unsaid If it is left uninterpreted by those who are knowledgeable, the not-so-knowledgeable may leap to unwarranted conclusions—particularly with respect to relative efficiency These studies are designed to answer the "how much" question only, usually by means of relatively straightforward, accounting-like calculations

A second set consists of studies that statistically estimate average behavior between two or more cost-related variables These studies usually are based on some form of simple or multiple regression. Probably the most frequent example of this type of analysis involves regressing costs (total or average expenditures) on the number of students or the number of credit hours in the form of a cost function Likewise, the number of students or the number of credit hours can be regressed on the number of faculty and other available input measures in the form of a production function The unit of analysis is almost always the institution (e g , Maynard, 1971), a college within a university (e g., Razin and Campbell 1972), or a department (e g , Tierney, 1980), with cross-sectional or time-series data being used singly or in combination The goal of such studies is to understand how average or marginal costs behave in response to changes in enrollment or credit-hour production

Regression, in one form or another, is a popular and powerful tool in econometrics, but it is subject to a variety of potential problems One such problem is multicollinearity, which occurs when two or more of the independent variables are highly correlated It does not affect how well the dependent variable can be predicted, but it can raise havoc when a regression model is used to explain rather than to predict Under statistically ideal conditions, the respective estimated regression coefficients represent the contribution, or marginal impact, of each of the independent variables on the behavior of the dependent variable When multicollinearity is present, the confidence intervals on the coefficients become very large, making it difficult and sometimes impossible to disentangle the unique effects of the respective independent variables. Kennedy (1979) provides an excellent discussion of these and other pertinent econometric issues in a manner suitable to readers with various backgrounds An example of how multicollinearity may interfere with an attempt to explain cost behavior in higher education can be found in Brinkman (1980)

Regression analysis of the above kind generates data on *average* behavior by fitting a line or plane *through* a scatter of points. On occasion, a policy issue might be better addressed by studies that focus on *efficient* behavior These studies have been extremely rare in higher education They usually employ linear programming techniques or other procedures to compute a convex hull, as in Carlson (1975) and Gray and Weldon (1978). Constrained-residuals regression is another possibility One can think of these procedures as fitting a line or a plane (the "efficient surface") *around the edge* of a scatter of points It is also possible to use standard regression techniques on a set of production centers that have previously been shown to be efficient (as in Trueheart and Weathersby, 1976). The goal in any case is to find the frontier, or most efficient, utilization of resources Needless to say, when employing these techniques, rather substantive assumptions are necessary regarding the analyst's ability to control for qualitative differences among the production centers (institutions, departments, etc.) and to measure output adequately in

other respects as well As noted earlier, these matters are always a potential problem in higher-education costing, but they are especially so when a sensitive issue like efficiency is the focus of attention The analyst who ventures forth in this arena had better be well prepared

The three types of studies considered thus far take accounting or multivariate statistical approaches to estimating costs A fourth type of cost analysis uses an engineering methodology The terms "synthetic" and "constructed" may also be used to describe this approach It consists of modeling a production process by decomposing the process to a very basic level and then studying alternative ways of putting the pieces back together to achieve alternative ends The best known of these studies, and there aren't many published in higher education, is the study of liberal-arts education conducted by Bowen and Douglass (1971) They considered various ways that the typical production relationships (class sizes, modes of instruction, and so on) could be arranged to impact on costs Costs in medical education have been looked at in similar fashion (Gonyea, 1978), as have costs in a variety of disciplines in a European university (Bottomley, 1972) We suspect that a number of unpublished cost analyses are done in this manner While the engineering approach avoids some statistical pitfalls, it is hard to be very sanguine about its potential for yielding accurate cost estimates Experience in higher education is slim, but not so in the federal government There, unfortunately, the record is generally not very good, as is evident in notorious cost overruns in military acquisitions

An additional type of analysis, which combines elements of the accounting and engineering approaches, was introduced into higher education recently by Robinson, Ray, and Turk (1977) They refer to it as cost-behavior analysis, and it is essentially a set of procedures designed to project cost behavior for planning One of the conceptual structures they put forward relates to the task of identifying factors that affect costs They argue that these factors can be placed in three categories the *volume* of the activity, the *environment* within which the activity is carried out, and *decisions* that might affect the cost of the activity For example, the quantity of inputs required may vary disproportionately with the volume of activity Environmental factors include items such as inflation in the prices of inputs and regulations imposed from without that affect the conduct of the activity Numerous decisions can affect costs, of course, especially those that deal with the disposition of resources, such as granting a sabbatical leave, using part-time rather than full-time staff, and so on This simple scheme for categorizing cost factors should appear to be useful for a variety of costing applications (for example, see NCHEMS-NACUBO, 1980)

We have touched on the negative side of several procedures to spread a little healthy caution about costing Costing looks easier than it is, and it is often done poorly In addition to the problems already mentioned, the following provides some additional reasons why analysis frequently fail to handle costs correctly *Asking the wrong question(s)* can be a major source of trouble For instance, asking about what has already been invested instead of focusing on the future is likely to lead to inappropriate cost data for planning purposes In estimating future costs, *uncertainty* is a factor Those who had the task of estimating utility costs during the 1973 oil embargo won't need to be reminded of this phenomenon. *Ignorance* is another element For example, in most instances we simply do not know what the proper distribution is between fixed and variable costs Sometimes bad costing is due to *oversight* Some portion of the operating cost of a new piece of equipment, for example, can easily be overlooked, as many microcomputer users are probably discovering *Optimism* can cause problems, too For example, underestimating the time needed to complete a project occurs frequently *Prevarication* is not beyond the realm of the possible either, as in the case where, unbeknownst to the buyer, initial cost estimates are based on what is likely to be an inadequate product or level of service *Lack of standardized terminology* can create hazards when comparing costs *Assignment* of cost must, of necessity, be arbitrary in some instances, such as when products or services are produced jointly

What Type of Cost Should Be Calculated?

Once a clear sense of overall direction has been established, the next step is to consider what kind of costs to calculate Cost can and should be calculated in many ways No one has improved on the 1923 formulation by Maurice Clark that there are different costs for different purposes In other words, there is no single right answer to the question, How much does this cost? The appropriate answer depends on the context that gave rise to the question A summary of the many possibilities for calculating costs can be condensed from Adams, Hankins, and Schroeder (1978), who pointed out that costs are defined by the following

1 Cost objectives (input, output, activity, organizational unit)
2 Cost basis (historical, projected, standard, imputed, replacement)
3 Cost assignability (direct, indirect, full)
4 Cost variability (fixed variable, semivariable)
5 Cost-activity relationship (total, average, marginal)
6 Cost-determination method (specific service, continuous service)
7 Cost-time relationship (time period, accrual or cash, deflated)

Elements of these categories can be combined to produce a very long list of alternative ways of calculating cost These alternatives constitute a checklist for the analyst, as a choice must be made within each category The choice will occur by default if not done consciously Each category should be examined within the framework of the study's purpose to ensure that the right type of cost is calculated In what follows, the authors define and describe each of these costing dimensions and look at some of the more common combinations as they are used in higher education

Cost Objectives. Anything to which cost is assigned is a cost objective For example, the *inputs* of the educational process can be cost objectives These factors of production include faculty labor, other labor, supplies and services, and capital equipment and facilities These factors may be further subdivided, depending on the cost analysis being made. Cost calculations of inputs are often made in a budgetary context Alternatively, it is possible to make cost calculations for an *output* This approach is very common in higher education and usually focuses on student credit hours or student FTE Less common are calculations that consider degrees granted, journal articles produced, patents granted, or other outputs These are limited and problematic ways to define outputs, especially in light of difficulties in dealing with quality and instances where the same

inputs produce multiple outcomes, i e , joint production

It is also possible to calculate costs for specific *activities* or functions Activities can be defined as broadly or narrowly as desired Examples include the cost of processing a warrant, the cost of performing a repair, or the cost of making a computer run More broadly defined functions include instruction and student services Costing of narrowly defined activities is usually done for purposes of management control, cost accounting, and recharge applications Costing of broadly defined activities is commonly used for budgeting, comparative analysis, and financial reporting For example, the finance portion of the Higher Education General Information Surveys (HEGIS) reports expenditures by broad functional areas such as operation and maintenance of the plant Finally, the cost of an *organizational unit* (chemistry department, admissions office, and so on) may be calculated The most common application of this type of costing is for budgetary and financial-reporting purposes and for comparative analysis An institution s annual audit, for instance, will usually contain cost data in this format

Cost Basis. Common bases for calculating costs include historical, projected, standard, imputed, and replacement value *Historical* costs concern a time period in the past for which actual data are available This type of cost was, for a time, the focus of almost all higher-education costing and still remains quite common *Projected* costs are based on estimates for the future time period (or a current or past period for which the data are not yet available) They are also commonly used in higher education, particularly for budgetary purposes *Standard* costs are defined as what something should cost They may be derived from historical cost patterns, agreed on through negotiation, or developed by conceiving of ideal practice (constructed costs), or some combination thereof Standard costs are most commonly used for management and control of specific operations In some cases, standard costs are also used for budgetary purposes, almost always in their negotiated form. *Imputed* costs are estimates of costs based on observations of alternative opportunities For instance, the imputed cost of a research activity could be estimated in terms of the interest that would be earned if the funds required were invested in securities instead *Replacement* costs are the funds needed to replace a particular factor of production at current price levels This type of costing is generally confined to planning for capital facilities or major pieces of capital equipment

Cost Assignability. Cost assignability is the designation of portions of full costs as either direct or indirect costs *Direct* costs are those that are immediately related to a cost objective For example, faculty salaries are a direct cost of instruction, research, and public service Direct-cost calculation has a variety of uses in planning, budgeting, and management control Direct costs are particularly useful for management control because they are, in fact, under the control of the respective organizational units *Indirect* costs (often called overhead costs) are not directly related to the cost objective but are part of the supportive environment in which the cost objective exists For example, costs incurred by the purchasing office and the physical plant department are indirect costs relative to the instructional function In some cases, indirect costs are defined as including capital costs in the form of depreciation. Indirect-cost calculation is used for recovering costs from outside funders (especially the federal government) and for some planning and budgeting purposes *Full* costs are the sum of direct and indirect costs They are employed for some planning purposes and were once very commonly used

Cost Variability. Costs can vary with changes in the volume of output A *fixed* cost is one that does not vary, a *variable* cost changes as the volume of output changes In most contexts, the salary of a department chairperson would be an example of a fixed cost, while the cost of supplies for a laboratory course typically would be variable Some authorities add the category of *semivariable* (or mixed) costs The term usually refers to costs that vary with output but not proportionally This means that semivariable costs include both variable and fixed costs in a form that is impossible, inconvenient, unnecessary, or undesirable to disaggregate A variety of administrative services probably can be viewed as having semivariable costs Calculating fixed and variable costs is useful for a wide variety of budgeting, planning, and management control purposes Unfortunately, separating fixed from variable costs cannot be done by a straightforward calculation Ingenious methods have been proposed in specific instances (e g , Baughman and Young, 1982), but there are no widely accepted procedures Indeed, fixed and variable costing inevitably involves policy determination and the political process (Allen and Brinkman, 1983) Therefore, anyone who is asked to do this type of costing should concentrate on people and decision processes rather than on costing techniques

Cost-Activity Relationships. Costs can be calculated in relation to the level of activity *Total* cost is the sum of all expenditures associated with a given level of activity Total cost, therefore, is not synonymous with full cost, which is the sum of direct and indirect costs. *Average* cost (also called unit cost) is simply the total cost divided by the number of units associated with the activity Average cost is a very commonly used measure for the entire range of costing applications *Marginal* cost is the change in total cost associated with adding one unit to the level of activity It is an extremely important theoretical notion that, in many instances, has greater utility for decision making than average cost Unfortunately, marginal costs are usually very difficult to determine (see Allen and Brinkman, 1983, for an extended discussion), and their use in higher education to date has been largely in academic research on cost behavior, with some budgeting applications Incremental cost is a related concept It refers to the cost associated with increasing the level of activity by some amount When that amount happens to be only one unit, incremental and marginal cost are the same Incremental cost usually is easier to calculate than marginal cost Theoretically, the latter is a continuous function, while the former may change either continuously or discontinuously (that is, as a step function)

Cost-Determination Methods. There are alternative ways of associating costs with cost objectives The critical factor in choosing a particular method is the technical nature of the production process. The *specific-service* method associates costs with specific projects or jobs that can be identified separately The costs of renovating a building would be handled in this manner, as would a research project. In the other common approach, the *continuous-service* method, costs are associated with processes or organizational entities that involve or provide similar units of service Lower-division instruction provided by an academic department would be treated in this way The continuous-service method may be applied to determine a cost per unit of service Instructional cost per student is a common example

Cost-Time Relationships. Costs are usually calculated over a *time period*, with weeks, months, quarters, years, and biennıums being most common Costs are incurred either when money actually changes hands (*cash* accounting) or when an obligation is made (*accrual* accounting) The difference is illustrated by an instance in which a faculty member receives a paycheck on July 15 for time actually worked in June Under cash accounting the cost is incurred in July, but under accrual accounting the cost would be incurred in June, when the work was done Assuming a July 1 through June 30 fiscal year, the two possibilities for cost calculation would result in costs being attributed to different fiscal years Higher-education accounting is done on a modified accrual basis, in turn, nearly all higher-education costing is done by the accrual method The two most significant modifications to standard accrual accounting adopted by higher education are the absence of depreciation accounting and the treatment of costs in academic terms lying across fiscal-year boundaries The other important element of cost-time relationships is the effect of he passage of time on costs Any cost calculation over multiple time periods must reckon with changes in the prices of inputs, a thorough treatment of procedures for *deflating* costs in higher education can be found in Halstead (1983) Moreover, although the previous outline does not mention it, any projection of costs into the future should consider *discounting* those costs (relative to the cost of money) Any text on financial management is likely to deal with present-value discounting

Additional Categories. There are a few additional ways of categorizing costs that can be useful in an analytical context In planning for a new program, for instance, it is useful to distinguish between *nonrecurring* and *recurring* costs The nonrecurring variety includes costs incurred in developing new technologies required by the program and investment costs incurred in securing equipment and setting up the new program Recurring costs are incurred in operating the program and maintaining its capability The line between recurring and nonrecurring costs is not firm For instance, for a new program of short duration, the costs of recruiting and training staff are usually nonrecurring For a program that continues on for a long period or indefinitely, these costs will likely recur The analyst can be helpful by calling attention to these two types of costs wherever the objective is to determine the total costs of a proposed program

Costs can be distinguished by the extent to which they can be affected by the manager or organizational unit involved *Controllable* costs are within the power of the manager. Typical examples are operating expenses and travel *Uncontrollable* costs are not subject to policy determination Typical examples are utility rates and salaries determined by authorities outside the unit Calculating costs by their controllability is normally done for management control and budgeting purposes The dimension of control is one reason why it is important, in preparing for a cost study, to take into account the management level for which the study is being done

When costs are being estimated as a means of determining the most appropriate future course of action, *sunk* (past) costs should be ignored That is, the fact that costs have already been incurred ought not to be a reason, in and of itself, to commit additional resources and thereby to incur additional costs. This advice, however, is regularly ignored, often leading to unfortunate consequences. The analyst who accepts this advice and ignores sunk costs can help managers focus their attention on the appropriate cost

What Types of Costs Are Commonly Calculated?

Of the many types of cost calculation that are theoretically possible, a fairly large number are actually used in some economic sector Most costing activity in higher education, however, is confined to a few types, which we shall briefly review

One of the two most common forms of costing in higher education is the calculation of historical, full, average cost of outputs This type of costing is based largely on the pioneering work of John Dale Russell (1931) dating back to the 1920s and 1930s The California and Western Conference cost study (Middlebrook, 1955) is one of the best known examples It reached its highest peak of development during the 1970s with the national costing models (IEP, CAMPUS, PLANTRAN, etc) and various state and institutional efforts Their purpose was to calculate historical average costs for student credit hours, student FTE, or degrees, generally in terms of full costs, although in some cases direct costs were used The IEP costing system went to elaborate technical lengths to allocate direct and indirect costs (including depreciation) to degree production (NACUBO-NCHEMS, 1977) It has been argued that these cost calculations are inappropriate for detailed, micro-level management control, budgeting, or planning (McLaughlin, Fendley, Winstead, Montgomery, and Smith, 1983) However, they appear to have significant applications for aggregate-level budgeting and planning

The other of the two most common approaches is the calculation of historical, total, indirect costs of inputs This type of cost calculation is done primarily for claiming reimbursement from the federal government and from other organizations or individuals that have contracts with higher-education institutions for the performance of services by the institution Elaborate regulations are described in Circular A-21 (Executive Office of the President, 1979) regarding what methodologies are allowed for calculating indirect costs when dealing with the federal government Most institutions also use these approaches for calculating indirect costs in other contexts

Formula budgets based on cost studies are widely used by states and systems The traditional method of cost calculation for formula budget uses full or direct average costs that are calculated on a projected or standard basis These costs are usually assigned to inputs, outputs, and activities Many budget systems use combinations of these types of costs for different functional areas or objects of expenditure For example, faculty salaries might be set using a peer-group analysis to determine standard costs, while utility costs would be projected on the basis of historical costs and an inflation factor The mix of types depends on the complexity of the formula In recent years, this methodology has occasionally included fixed and variable costs and has used marginal instead of average costs Its purpose has not changed, and the alternative cost calculations will often be add-ons to the traditional approach Gross (1982) shows the type of calculation used on a state-by-state basis

Other less common but still relatively prevalent types of cost calculation include full or direct total-replacement cost of an input (used primarily for capital-construction analysis and financial reporting) and projected direct total cost of an organizational unit (used for budget

purposes) Two additional types of cost calculation are not widely used in higher-education administration but do appear with some frequency in the scholarly literature on higher-education finance One is historical, full, marginal cost of an output The other is average or total direct cost of an input, calculated on a historical or projected basis

In summary, many different kinds of cost calculation are possible Before a methodology is chosen, careful consideration should be given to their use, as well as to the strengths, weaknesses, and designed purposes of the various costing procedures

How Should Cost Be Measured?

The cost of a program or activity can be measured in one of four ways (1) estimate and list the *resources required,* (2) identify and describe the *alternative uses* of these resources, (3) estimate the *value of the alternatives*, or (4) estimate the *dollar expenditures* entailed (Fisher, 1971) A few observations are in order Any one of these procedures, if done well, can be helpful to the manager, but they do have a hierarchical relationship For instance, the fundamental meaning of "cost" is found in estimating the values of the alternatives (the third option) These values cannot be estimated, however, unless alternatives can be identified (the second option), and the alternatives cannot be identified without knowing the resources required (the first option) The alternatives depend on the options and constraints facing the manager which, as we noted earlier in discussing the central dimension, are partly a function of management level Finally, although it appears simple to present an estimate of dollar expenditures as an estimate of costs (perhaps because it is done so frequently), this procedure is the most ambitious of the four options In effect, it accomplishes all three of the other procedures Fisher emphasizes that great care should always be exercised in deciding whether or not estimates of dollar expenditures are reasonable estimates of costs In instances where they are, it is only because the market pricing mechanism helps us to identify and evaluate alternatives It is also worth noting that historical dollar expenditures can be quite misleading in situations in which great flexibility exists with respect to the resources required For example, consider a case in which a course was taught by a professor but could have been taught by a teaching assistant Which historical information, dollar expenditures or the amount of teaching time required, would be most useful for planning purposes? This issue is developed in Simpson and Sperber (1984)

As previously noted, cost is defined fundamentally as value foregone per unit produced This definition stems from the discipline of economics (Samuelson, 1976) The point is that the cost of something is to be measured and understood in terms of what is sacrificed to get it In theory, then, the resources applied to producing a specific thing need to be examined as to their utility in alternative applications and a comparison needs to be made In practice, economists seldom do this They assume that the market sends an accurate set of signals in the form of prices. They then measure comparative value in monetary terms. The assumption about the market depends, in turn, on a series of assumptions about perfect and free information perfect and instantaneous fungibility of resources, and a perfectly competitive environment. Since these conditions are seldom, if ever, met, actual economic cost studies are far simpler and less theoretically elegant than would be assumed from that definition of cost Cost studies by noneconomists typically are even simpler, and often lack an adequate theoretical foundation

Defining or calculating value foregone is not a simple task Individuals calculate value according to a complex, personally unique, and poorly understood set of desires that can be expressed in both monetary and nonmonetary terms The difficulty of transferring individual preference functions to organizations has led to a focus on monetary values or, in some cases, on the assignment of monetary values to nonmonetary benefits

Even if the definition of value is restricted to that which can be expressed in monetary terms, the calculation of value remains far from simple For one thing, one must determine which values to include Analysts interested in institutional costs usually start with the value foregone of the various inputs that are directly related to producing a unit and then optionally add allocated indirect (overhead) costs, multiplier effects (direct and indirect effects on the economy), tax-feedback loops, implicit costs (such as students foregone earnings), and spillover costs (negative externalities or values foregone by someone else, pollution being the classic example) Clearly, the values included in cost vary according to the purpose of the cost analysis In practice, the value calculation is usually highly simplified Such simplification, or even legitimate differences in complex value calculations, can radically affect the outcome of the calculation This is particularly true for a complex, public-service industry like higher education

Cost-Benefit Analysis. If one employs the fundamental notion of cost, wherein costs are foregone opportunities (or benefits or value), then it is clear that costs and benefits are just two sides of the same coin Indeed, to ignore the one is to ignore the other When used in this framework, cost analysis can be understood as nothing other than the identification, measurement, and evaluation of the various benefits flowing from a set of alternative choices

In at least some portion of the literature, "cost-benefit analysis" refers to a procedure that treats all costs and all benefits in dollar terms In contrast, "cost-effectiveness analysis" is used to refer to situations in which benefits are measured in terms other than dollars In this case, only programs with similar or identical goals are compared, with a common measure of effectiveness used to assess them (Levin, 1983, also see Denton and Smith, 1983, for a recent cost-effectiveness study in higher education)

A cost-benefit analysis consists of three stages determining future benefit streams, quantifying those benefits in the appropriate dollar terms, and comparing cost-benefit ratios for alternative investments Only the last stage is likely to be easy Benefit streams may be long-run and vague as well as immediate and explicit Benefits may be difficult to express in dollars or, for that matter, in any other common terms Benefits (and costs) occurring in the future will require discounting, thus rendering the analysis subject to the vagaries of choosing an appropriate discount rate In short, cost estimation, when costs are measured in terms of foregone benefits, is likely to be difficult and subject to error But cost estimates are an intrinsic part of much planning and decision making, insofar as those processes are rational, and the need for them won't go away anytime soon. They are likely to be more meaningful if some dimension of opportunity cost can be included

An Illustration

When an institutional researcher is given a costing assignment, the question will usually be phrased, What does X cost? As we have stressed throughout, in order to answer this question responsibly, a number of prior issues need to be addressed We now illustrate these issues by means of a hypothetical example

Setting the Stage. Assume that you are the institutional researcher at an institution that is considering upgrading its recruiting capabilities and that you have been asked to assess the costs of the proposed enhancements Further discussion reveals that there is a reasonably concrete proposal on the table Some expenditure data has been included as part of the proposal, but the administration would like a thorough cost analysis done by your office The administrators respond affirmatively to your question as to whether it would be appropriate to estimate what the net costs would be of the expanded operation, since it will generate both a revenue stream as well as an expenditure stream They also agree that five years would be about right for the planning horizon

Determining Purpose. The request you received, and have already helped to refine, seems clear enough Yet the question of purpose is worth further consideration, as it often is. After all, enhancing the institution's recruiting capability is not likely to be an end in itself Suppose, for example, that the ultimate objective is to maintain the current level of enrollment when the institution's customary pool of potential students declines in size Given this objective, you might wonder whether the more appropriate cost study would be one in which the costs of alternative ways of maintaining enrollment are analyzed More effective recruiting is one way to maintain enrollments, but an enhanced retention rate is another obvious possibility. Should you propose doing this expanded cost analysis? It depends on the management level requesting the study It would make sense to do so if the study has been requested by the president or cabinet, because presumably they could choose to implement one of the alternative activities If the request has come from the admissions director, who is seeking technical support for his or her own analysis, investigating the cost of the retention alternative, for instance, would not be useful because diverting resources to that activity is (typically) outside the prerogatives of the admissions director

Still thinking of purpose, you ask yourself another question. What type of decision am I being asked to support? In this case, the answer is clear It is an investment decision, one that looks much like a conventional business decision Thus, the proper overall perspective to adopt is that of a business manager This perspective provides direction as to persons on campus with whom you might consult, literature that is likely to be helpful, and the sort of information that will probably be needed With respect to the latter, for instance, at least some information about the "market" (demographics, student choice patterns, and so on) is likely to be important for the study

Type of Analysis. What type of analysis makes the most sense? It depends on the precise nature of the question to which you must respond. Suppose that the question is, How much will it cost to recruit an additional 200 students? In this case, the best bet probably would be a combination of a statistical and an engineering (or constructed cost) approach. A statistical analysis of previous activities in the admissions area or a cross-sectional study of admissions programs at other institutions could be used to generate estimates of the pertinent input-output relationships (such as, It takes X counselors to generate Y matriculants) These estimates can be combined with the judgment of the admissions staff to provide the basis for constructing a list of the inputs, or resources, that would likely be required to achieve the stated objective A statistical analysis could also be used to directly estimate probable expenditures For example, you may be able to estimate the marginal cost of an additional matriculant, which would enable you to estimate the costs associated with recruiting any number of additional students

Type of Cost. To determine the appropriate type of cost to calculate, the simplest approach is to go through each of the cost categories previously listed The primary cost objective is an activity Some other costs, such as the cost of an output (e g , the cost of recruiting an additional student) might be incorporated in the study, but essentially it is the cost of an enhanced recruiting activity that is to be estimated Projected costs will be the cost basis In projecting costs, you may be able to use a variety of standard costs, such as per diem expenses for admissions counselors when they are on the road As for cost assignability, it is always a good idea when projecting the cost of new activity to try to estimate full costs To the extent possible, it would probably be useful to distinguish between variable and fixed costs If this can be done, then any subsequent unit costing with respect to this activity can be more sophisticated For the cost-activity relationship, you will probably want to go with all three options total costs over the five years of operation, which measures the gross investment, average costs, so that you can make some comparisons with current average costs for recruiting at your own or other institutions, and marginal costs, so that you can help decision makers focus on how the level of activity may affect unit costs Continuous service for the cost-determination methods makes the most sense In regard to the cost-time relationship, the safest course is to use the modified accrual procedures common in higher education Also, the five-year period is far enough into the future so that you will need to do present value discounting, and you will want to consider the effects of inflation, too The expected revenue stream should also be discounted to reflect net present value, and the effects of inflation on revenues should be taken into account Be sure to make these adjustments in a manner consistent with any adjustments you make to future costs Among the other cost considerations that you might undertake would be to analyze recurring/nonrecurring costs Does any new technology need to be developed? If enhancing the recruiting capability entails an expanded information system, the answer is likely to be in the affirmative Will there be investment costs for new equipment, such as automobiles for the additional counselors? Any training costs? Will they recur in a five-year period? The answer in both instances is probably yes

Measuring Cost. One of the last steps in preparing for the study is to decide on an appropriate measure for costs You might decide that a listing of required resources (in physical terms) should be included in the report. If so, keep in mind that those requesting the study probably will want to see a conversion to dollars as well Finally, if you have not already done so, you ought to have a review session with your institution's finance officer to go over the costing plan.

Those requesting the study can be expected to evalu-

ate the results of your analysis as they see fit But you ought to make the first pass at it and attempt to draw out and delineate the decision points For instance, there might well be several distinct levels of investment where the risks/rewards change dramatically. Be sure to document your study and highlight any assumptions that you made . . and be prepared for further questions.

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